MMAC-Plus™ 9E423-24
Ethernet SmartSwitch Module
User's Guide

CABLETRON SYSTEMS

The Complete Networking Solution™

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Contents

Chapter 1 Introduction

Features 1-2
Related Manuals 1-5
Getting Help 1-5

Chapter 2 Installing the 9E423-24 Module

Unpacking the Module 2-1
User Accessible Components 2-2
Setting the 9E423-24 Module DIP Switch 2-3
Installing the Module in the MMAC-Plus Chassis 2-5
The Reset Switch 2-7
Telco Connector 2-8

Chapter 3 Operation

ENIB 3-2
SecureFast Switch 3-2
i960 Core 3-2
INB NIB 3-3
System Management Buses 3-3
    SMB-1 Bus 3-3
    SMB-10 Bus 3-3
System Diagnostic Controller 3-4
DC/DC Converter 3-4
INB Interface 3-4

Chapter 4 LANVIEW LEDs

Chapter 5 Specifications

Technical Specifications 5-1
    CPU: 5-1
    Memory: 5-1
    Standards: 5-1
    Network Interfaces: 5-1
Safety 5-2
Service 5-2

Physical 5-2
Dimensions: 5-2
Weight: 5-2
Environment: 5-3

Chapter 1

Introduction

The 9E423-24 (Figure 1-1) is a 25 port switching module. Two RJ-71 Telco connectors support 24 10BASE-T ports with the 25th port connecting to the Internal Network Bus (INB) backplane interface. This module uses a SmartSwitch ASIC design and an advanced Intel i960® microprocessor. This microprocessor provides a platform for all management functions within a scalable RISC-Based Architecture.

The module can operate in two modes; as a 24 port Ethernet traditional switch (using 802.1d standards) with a high speed backbone connection or as a Secure Fast Switch (SFS) with 24 Ethernet connections. Each port of the 9E423-24 can be configured to operate in the Full Duplex mode. This configuration allows each port to provide a full 20 Mbps of bandwidth for file servers or high end user intensive work stations.

Network management information is available through a variety of methods. All information based on Simple Network Management Protocol (SNMP) is accessible either via an in-band (Front Panel port), Side Band (SMB-10), or via the Environmental Module's COM ports. Serial Line Internet Protocol (SLIP) or Point-to-Point Protocol (PPP) are supported by the Environmental Module's COM ports. For more information on the SMB-10, SLIP or PPP refer to the MMAC-Plus Local Management User's Guide.

The 9E423-24 also features front panel LANVIEW™ Diagnostic LED's to offer at-a-glance status information about each front panel port as well as the operation of the overall module.

Ethernet networks are connected to the 9E423-24 module through two standard RJ-71 Telco connectors built in the front of the module. Each connector provides 12 Ethernet 10BASE-T connections for UTP and STP links up to 100 meters long.

Features

Processor

The 9E423-24 is equipped with an advanced Intel i960 microprocessor. This microprocessor provides a platform for all management functions such as Spanning Tree, RMON, and MIB support within a scalable RISC-Based architecture.

Fast Packet Switching

The 9E423-24 incorporates a hardware based switch design referred to as the SmartSwitch ASIC, a collection of custom ASICs designed specifically for high speed switching. Because all frame translation, address lookups, and forwarding decisions are performed in hardware, the 9E423-24 can obtain a throughput performance of greater than 750K pps.

Management

The 9E423-24 features SNMP for local and remote management. Local management is provided through the RS-232 Com ports on the MMAC-Plus Environmental Module using a standard VT-220 terminal or emulator. Remote management is possible through Cabletron's SPECTRUM or any SNMP compliant management tool. Included as management features are the IETF Standard Management Information Base (MIBs) RMON (RFC1271), IETF MIB II (RFC-1213), IETF Bridge MIB (RFC-1493), and a host of other Cabletron enterprise MIBs. The 9E423-24 also offers the user a wide variety of statistical network management information to enhance network planning and troubleshooting. This module provides information for each front panel Ethernet 10BASE-T port, including packet counts along with errored frame information such as collisions, CRCs, and Giants, via a variety of industry standard and private MIBS. Industry standard IEEE 802.1d bridging, including Spanning Tree Algorithm, is supported.

Connectivity

The 9E423-24 module has one interface to the INB and two front panel RJ-71 Telco connectors. The INB interface is a fixed connection to INB-2 which allows the 9E423-24 to communicate with other MMAC-Plus modules supporting various LAN technologies including: Token Ring, FDDI, Ethernet, WAN and ATM. Each front panel RJ-71 connectors provide 12 Ethernet 10BASE-T connections for UTP and STP links up to 100 meters in length.

Standard Ethernet/Full Duplex Operation

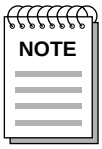
The 9E423-24 Module supports 10BASE-T. The use of 10BASE-T allows each port on the 9E423-24 Module to be configured, through local and or remote management (SNMP), to operate in standard Ethernet mode (simplex) or full duplex mode. Operating in standard Ethernet mode limits bandwidth to 10 Mbps per port, while operating in duplex mode doubles bandwidth from 10 Mbps to 20 Mbps per port.

Management Information Base (MIB) Support

The 9E423-24 provides MIB support including:

- RMON (RFC-1271)
- IETF MIB II (RFC-1213)
- IETF Bridge MIB (RFC-1493)

and a host of other Cabletron Enterprise MIBs.



For a complete list of supported MIBs, refer to the release notes provided in the 9E423-24 package.

INB

The 9E423-24 attaches to INB2 of the MMAC-Plus Backplane. The INB has a capacity of 2 Gbps to interconnect MMAC-Plus modules supporting Ethernet, FDDI, Token Ring, WAN and ATM networks. The INB transports fixed length data blocks between modules in the MMAC-Plus hub using a Time Division Multiplexing (TDM) design. Within the INB there is a 64 bit wide data bus and an eight bit control management bus. Each module that attaches to the INB has an INB Network Interface Block (NIB). The INB NIB converts canonical frames to fixed length data blocks for transmission onto the INB. For data blocks received from the INB, the INB NIB reassembles the data blocks received from the INB back into canonical frames for transmission to the SmartSwitch ASIC and ultimately to the front panel port. The INB can time slice its bandwidth using one of three methods. The default method is standard TDM round-robin bandwidth arbitration, the second method is for modules to reserve a specific amount of bandwidth using MONARCH, Cabletron's INB Bandwidth Arbitrator, the third method permits the lowest slot number to use any bandwidth not used by the previous two methods.

LANVIEW LEDs

The 9E423-24 uses LANVIEW – the Cabletron Systems built-in visual diagnostic and status monitoring system. With LANVIEW LEDs, you can quickly identify, at a glance, system status as well as the device, port, and physical layer status. Two LEDs indicate the transmission and reception of data from the INB MMAC-Plus backplane connection. Each of the 12 Ethernet front panel ports features two LEDs per port to indicate the port's Administrative status (enabled/disabled), LINK status (Link/Nolink), and Data Activity (receiving and transmitting data).

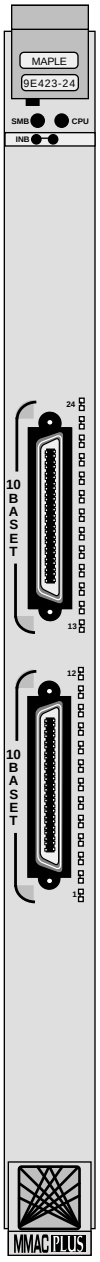


Figure 1-1. The 9E423-24 Module

Related Manuals

The manuals listed below should be used to supplement the procedures and technical data contained in this manual.

MMAC-Plus Installation Guide

MMAC-Plus 9C300-1 Environmental Module User's Guide

MMAC-Plus 9C214-1 AC Power Supply User's Guide

MMAC-Plus Local Management User's Guide

INB Terminator Modules Installation Guide

Getting Help

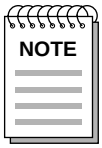
If you need additional support with the MMAC-Plus, or if you have any questions, comments or suggestions concerning this manual, feel free to contact Cabletron Systems Technical Support:

By phone:	(603) 332-9400
By CompuServe®:	GO CTRON from any ! prompt
By Internet mail:	support@ctron.com
By Fax:	(603) 337-3075
By BBS:	(603) 335-3358
By mail:	Cabletron Systems, Inc. P.O. Box 5005 Rochester, NH 03867-0505

Chapter 2

Installing the 9E423-24 Module

The 9E423-24 module occupies a single slot in the MMAC-Plus chassis.



The INB Terminator Modules must be installed on the rear of the chassis before powering up this module. Refer to the ***INB Terminator Modules Installation Guide*** *for information and installation procedure.*

Install the 9E423-24 module by following the steps starting below.

Unpacking the Module

1. Carefully remove the module from the shipping box. (Save the box and packing materials in the event the module must be reshipped.)
2. Remove the module from the plastic bag. Observe all precautions to prevent damage from Electrostatic Discharge (ESD).
3. Carefully examine the module, checking for damage. If any damage exists, DO NOT install the module. Contact Cabletron Systems Technical Support immediately.

User Accessible Components

Figure 2-1 shows the various components that can be accessed by users. These consist of an eight position dip switch (explained in the next section), replaceable PROMs, and sockets for memory and flash upgrades. These will be used for future upgrades. Instructions for installing the components will be supplied with the upgrade kit.

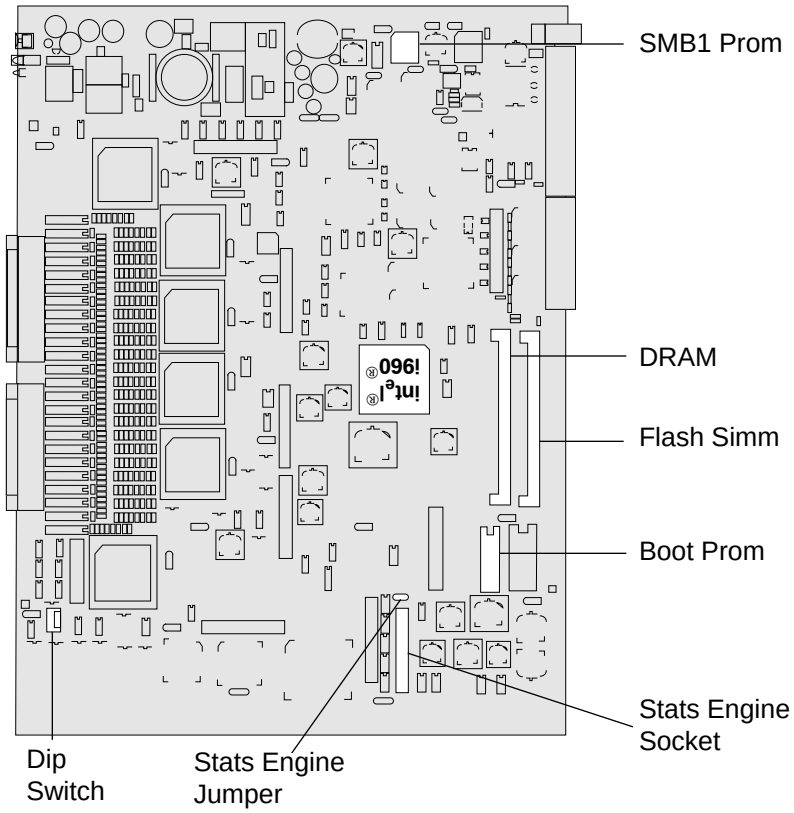


Figure 2-1. User Accessible Components

Setting the 9E423-24 Module DIP Switch

The DIP switch on the 9E423-24 Module (Figure 2-1 and Figure 2-2), is an eight switch DIP located near the bottom left corner of the module. Each switch is set according to the functions described in Table 2-1.

If switch settings are changed, the processor on the module must be reset by using the reset switch or repowering the module for the changes to take effect.

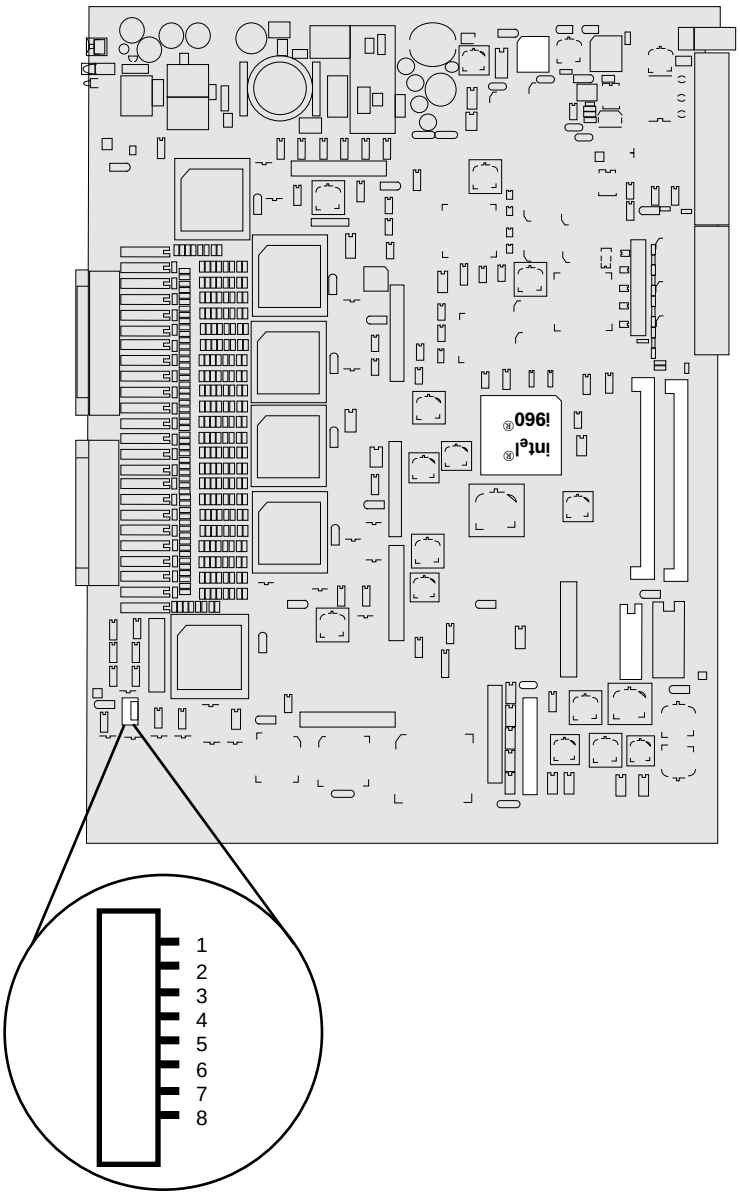


Figure 2-2. 9E423-24 Module DIP Switch location

See the **Cautions** at the end of this table.

Table 2-1. Function of DIP Switch

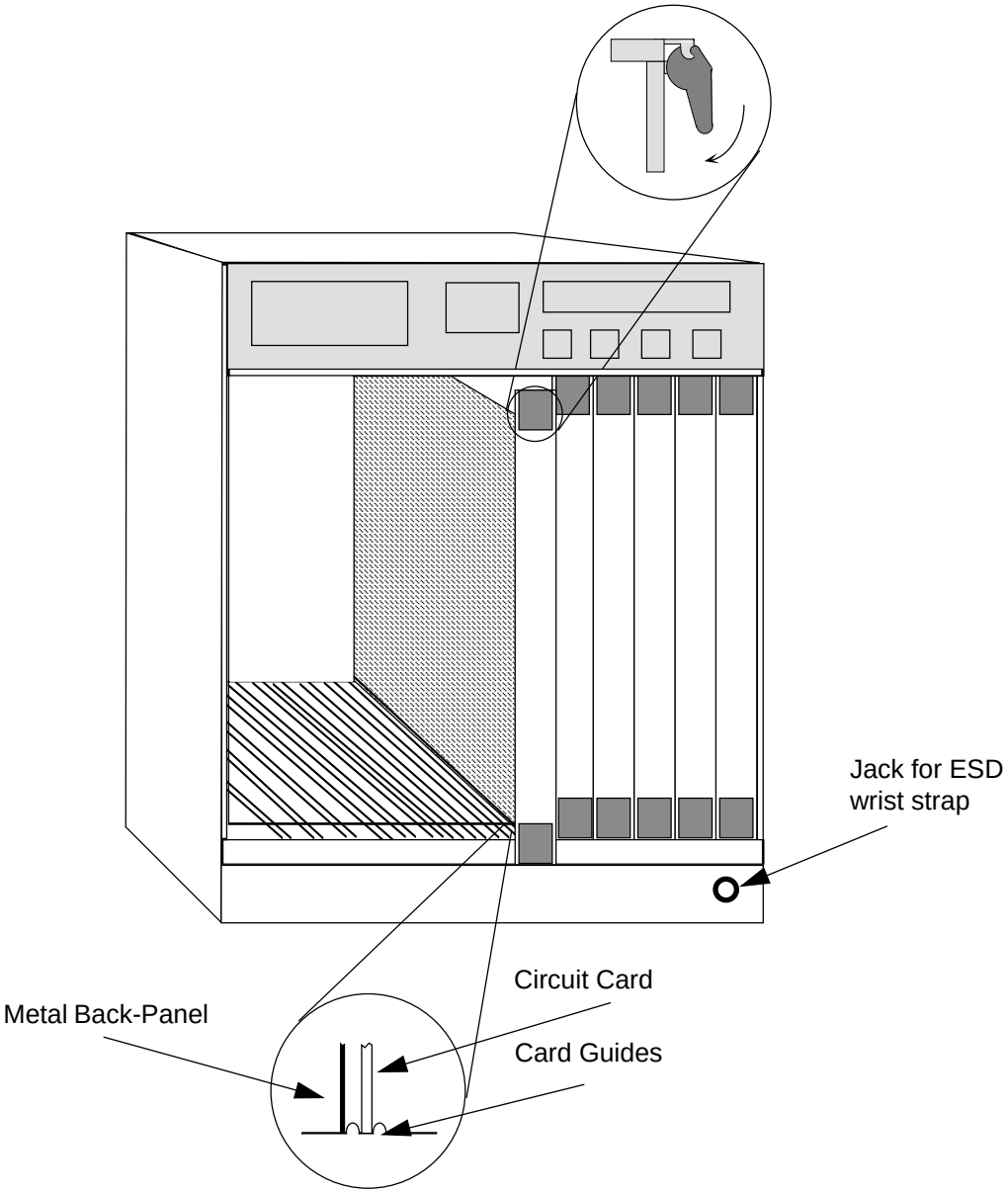
Switch	Function	Description
8	**Clear Password[-1]**	This module stores user entered passwords in NVRAM (Nonvolatile random access memory). To clear these passwords, toggle this switch and then reset the module's processor. Once the module resets, factory default passwords are placed in NVRAM. You can use these default passwords or, if desired, enter new passwords. To enter new passwords, refer to the Module Local Management User's Guide.
7	**Clear NVRAM[-2]**	This module stores user entered parameters such as IP addresses, subnet masks, default gateway, default interface, SNMP traps, bridge configurations and module specific configurations in NVRAM. To clear these parameters toggle this switch and then reset the module's processor. Once the module resets, factory default parameters are placed in NVRAM. You can use the default parameters or, if desired, enter new parameters. To enter new parameters, refer to the Module Local Management User's Guide.
6	**Force BOOTP Download**	This module uses BOOTP (Boot Strap Protocol) to download new versions of the image file into Flash Memory. This procedure forces image files to be downloaded from the PC or Workstation, configured to act as the BOOTP server, connected to the EPIM port in the Environmental Module.
5	**Reserved**	For Factory Use Only
4	**Reserved**	For Factory Use Only
3	**Reserved**	For Factory Use Only
2	**Reserved**	For Factory Use Only
1	**Reserved**	For Factory Use Only

1. **Caution:** Do not toggle Switch 8 unless you intend to reset the user configured passwords to the factory default settings.
2. **Caution:** Do not toggle Switch 7 unless you intend to reset the user entered parameters to the factory default settings.

Installing the Module in the MMAC-Plus Chassis

To install the 9E423-24 Module, in the MMAC-Plus Chassis, follow the steps below:

1. Remove the blank panel, covering the slot in which the module will be mounted. All other slots must be covered to ensure proper airflow and cooling.
2. Attach one end of the ESD wrist strap packaged with the MMAC-Plus chassis to your wrist. Plug the other end into the jack for the ESD Wrist Strap in the lower right corner of the MMAC-Plus Chassis shown in Figure 2-3.
3. Install the module in the chassis by sliding it into slots and locking down both the top and bottom plastic tabs, as shown in Figure 2-3. Take care that the module is between the card guides as shown, it slides in straight, and engages the backplane connectors properly.



Warning:
Ensure that the circuit card is between the card guides.
Lock down the top and bottom plastic tabs
at the same time, applying even pressure.

Figure 2-3. Installing the 9E423-24 Module

The Reset Switch

The Reset switch is located on the front panel, under the top plastic tab as shown in Figure 2-4. It serves three functions: resetting the i960 processor, shutting down the module, or restarting the module.

- To reset the i960 processor, press the reset switch twice within three seconds.
- To shut down the module, press and hold the reset switch down for three or more seconds.
- To restart the module after it has been shut down, press and release the Reset Switch.

For security, SNMP management can be used to disable the functions of this switch.

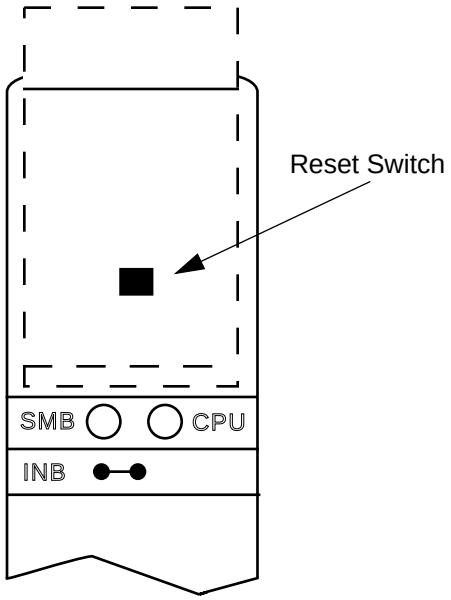


Figure 2-4. The Reset Switch

Telco Connector

The 9E423-24 front panel has two RJ-71 Telco connectors each supporting 12 10BASE-T ports. Figure 2-5 illustrates an RJ-71 Telco Connector.

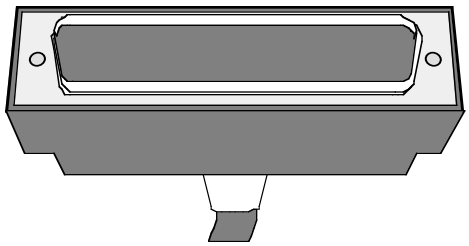


Figure 2-5. RJ-71 Telco Connector

Table 2-2 details the pinout connections for an RJ-71 Telco connector.

Table 2-2. Pinout Connections RJ-71 Telco Connector

Pin	Signal	Wire Color	Pin	Signal	Wire Color
1	RX 1-	Blue/White	26	RX 1+	White/Blue
2	TX 1-	Orange/White	27	TX 1+	White/Orange
3	RX 2-	Green/White	28	RX 2+	White/Green
4	TX 2-	Brown/White	29	TX 2+	White/Brown
5	RX 3-	Gray/White	30	RX 3+	White/Gray
6	TX 3-	Blue/Red	31	TX 3+	Red/Blue
7	RX 4-	Orange/Red	32	RX 4+	Red/Orange
8	TX 4-	Green/Red	33	TX 4+	Red/Green
9	RX 5-	Brown/Red	34	RX 5+	Red/Brown
10	TX 5-	Gray/Red	35	TX 5+	Red/Gray
11	RX 6-	Blue/Black	36	RX 6+	Black/Blue
12	TX 6-	Orange/Black	37	TX 6+	Black/Orange
13	RX 7-	Green/Black	38	RX 7+	Black/Green
14	TX 7-	Brown/Black	39	TX 7+	Black/Brown
15	RX 8-	Gray/Black	40	RX 8+	Black/Gray

Table 2-2. Pinout Connections RJ-71 Telco Connector (Continued)

Pin	Signal	Wire Color	Pin	Signal	Wire Color
16	TX 8-	Blue Yellow	41	TX 8-	Yellow/Blue
17	RX 9-	Orange/Yellow	42	RX 9+	Yellow/Orange
18	TX 9-	Green/Yellow	43	TX 9+	Yellow/Green
19	RX 10-	Brown/Yellow	44	RX 10+	Yellow/Brown
20	TX 10-	Gray/Yellow	45	TX 10+	Yellow/Gray
21	RX 11-	Blue Violet	46	RX 11+	Violet/Blue
22	TX 11-	Orange/Violet	47	TX 11+	Violet/Orange
23	RX 12-	Green/Violet	48	RX 12+	Violet/Green
24	TX 12-	Brown/Violet	49	TX 12+	Brown
25	N/C	Gray/Violet	50	N/C	Violet/Gray

Chapter 3

Operation

The 9E423-24 module is a 25 port device. Two front panel RJ-71 Telco connectors support 24 10BASE-T ports, each port being a separate collision domain with the 25th port connecting to INB2.

As shown in Figure 3-1, Ethernet Network Interface Blocks (ENIBs) convert data packets received from any of the 10BASE-T ports into a canonical frame format before forwarding to the SmartSwitch ASIC, while the Internal Network Bus Network Interface Block (INB NIB) converts data packets received from the INB into a canonical format before forwarding to the SmartSwitch ASIC.

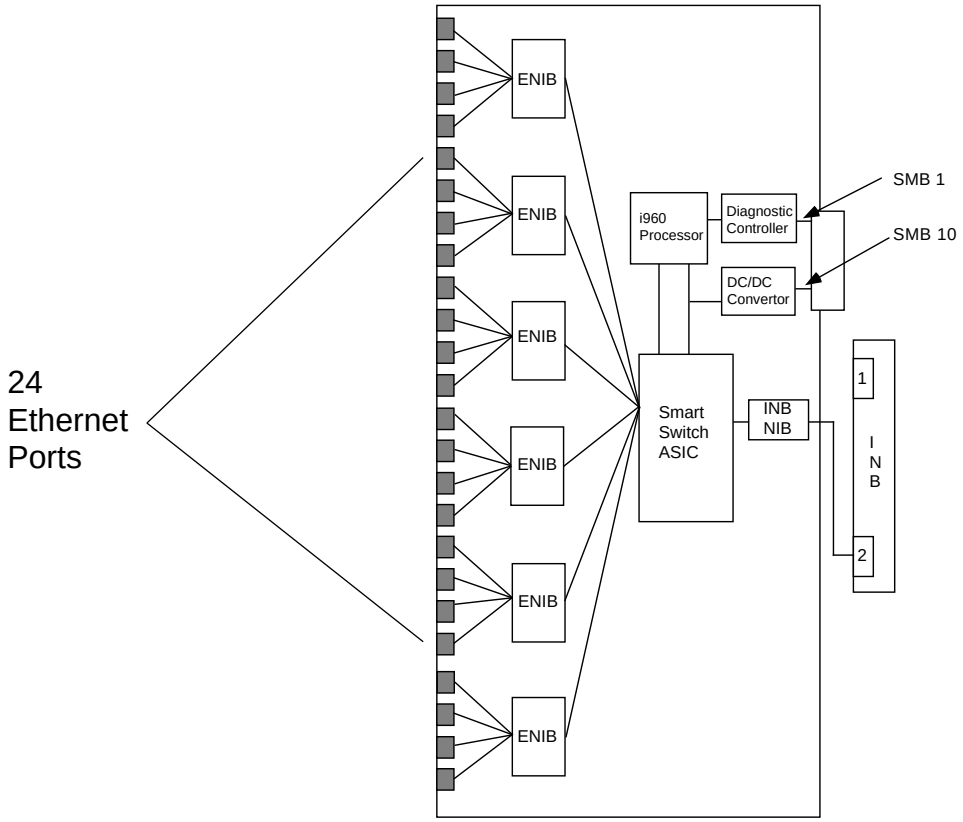


Figure 3-1. Packet Flow

All data packets destined for a front panel port, the INB, or the i960 are converted into the canonical format before forwarding to the SmartSwitch ASIC. Network Interface Blocks (NIBS) check for valid data packets entering the system. If an errored data packet is found, the SmartSwitch ASIC flags the error and does not forward the errored data packet to any outbound ports. Once in this common format, the SmartSwitch ASIC decides from header information the port destination of data packets. Data packets are then converted from the canonical format to the proper format for the interface destination whether it is a front panel port, or connection to the INB.

ENIB

The Ethernet Network Interface Block (ENIB) converts Ethernet data packets received through front panel ports into a common canonical format that allows the SmartSwitch ASIC Engine to determine the proper destination port. The ENIB also converts data packets from the common canonical format back to Ethernet data packets for transmission out front panel ports.

SmartSwitch ASIC

The SmartSwitch ASIC is a hardware based switch design that is the key building block of the MMAC-Plus hub. The SmartSwitch ASIC makes all filtering/forwarding decisions in custom hardware as opposed to software like in traditional bridges. This custom hardware enables the SmartSwitch ASIC to process over 750K frames per second. The SmartSwitch ASIC is designed to support up to 64 ports shared between the host processor, the INB backplane, and LAN/WAN interfaces on the front panel of MMAC-Plus modules. The SmartSwitch ASIC can operate in two modes; as a traditional switch or as a SecureFast Switch (SFS).

Traditional Switch

When operating as a traditional switch, the SmartSwitch ASIC makes filtering/forwarding decisions based on Destination Address (DA), with standard IEEE 802.1d learning.

SecureFast Switch (SFS)

When operating as an SFS switch, the SmartSwitch ASIC makes all filtering/forwarding decisions based on a Destination Address-Source Address (DA-SA) pair and its receive port. These DA-SA pairs with the associated receive port are programmed into the switch using Cabletron's SecureFast Virtual Network Server (SecureFast VNS). This provides the network administrator with the ultimate network security without the performance degradation found when using routers or bridges with special filtering capabilities. The MMAC-Plus hub can support individual modules operating in the traditional switch mode or SFS mode providing security where needed.

i960 Core

The i960 core provides the SNMP protocol stacks, to support industry standard MIBs. Additionally, Cabletron enterprise extension MIBs are supported for each media type. Advanced management services, such as the Distributed LAN Monitor, telnet and network address to MAC address mapping, are also provided by the i960 core.

The Host engine sends and receives packets via the CPU's SmartSwitch ASIC Interface. This allows the bridge to perform spanning tree protocol and other bridging functions. The SMB Interfaces provide communication to the Host Engine for management functions.

INB NIB

Each module that attaches to the Internal Network Bus (INB) has an INB Network Interface Block (NIB). The INB NIB converts canonical frames to fixed length data blocks for transmission onto the INB. For data blocks received from the INB, the INB NIB reassembles the data blocks received from the INB back into canonical frames for transmission to the SmartSwitch ASIC then from the SmartSwitch ASIC to the front panel ports.

System Management Buses

There are two management channels within the MMAC-Plus system: the SMB-1 and the SMB-10. These buses provide side-band management and inter-module management communication.

SMB-1 Bus

The SMB-1 is a 1Mbs management bus located within the MMAC-Plus. This bus is utilized by all diagnostic controllers in the system including connectivity modules, power supply modules and the environmental module. The SMB-1 transports inter-chassis information between system components, such as power and environmental information, as well as diagnostic messages. Periodic loop-back test are performed by all modules which share this bus to ensure the validity of SMB-1. In the event a failure is detected on SMB-1, the SMB-10 may be used as an alternate communication channel.

SMB-10 Bus

The SMB-10 is a 10Mbs management bus located within the MMAC-Plus. This bus is used for inter-chassis communication of modules as well as serving as an side-band management channel into the MMAC-Plus.

The SMB-10 is externalized from the chassis via an optional Ethernet Port Interface Module (EPIM) located on the front of the Environmental Module. Through an EPIM connection, full SNMP management of the MMAC-Plus is available side-band from user data. Modules which share the SMB-10 bus periodically send out loop-back packets to ensure the validity of SMB-10. If a fault is detected on the SMB-10, the SMB-1 can be used as an alternate communication channel by the modules.

System Diagnostic Controller

This diagnostic controller is composed of a Z-80 microprocessor and its supporting logic. The diagnostic controller is designed to control the power-up sequencing of modules, monitor the 9E423-24 input and output power parameters, keep watch over the main host processor, monitor the temperature, and control the SMB LANVIEW diagnostic LEDs. Although the system diagnostic controller and the main host processor can operate independently of each other if needed, they exchange information about each others status and overall module condition. The information gathered by the diagnostic controller is available to the network manager via local/remote management and the LCD located on the environment module. The 9E423-24 is designed to continue functioning in the event of a diagnostic controller fault.

DC/DC Converter

The DC/DC converter converts the 48 VDC on the system power bus to the necessary operating voltages for its host network services module. The diagnostic controller monitors and controls the operation of the DC/DC converter.

INB Interface

The INB Backplane is designed to transport fixed length data blocks between modules in the MMAC-Plus using a Time Division Multiplexing (TDM) design. The MMAC-Plus INB bus delivers 2.0 Gbps of true data bandwidth with all control and management communication being serviced on the 8 bit out-of-band bus. The INB can time slice its bandwidth using one of three methods. The default method is standard TDM round-robin bandwidth arbitration, the second method is for modules to reserve a specific amount of bandwidth using MONARCH, Cabletron's INB Bandwidth Arbitrator, the third method permits the lowest slot number to use any bandwidth not used by the previous two methods.

Chapter 4

LANVIEW LEDs

The front panel LANVIEW LEDs indicate the status of the module and may be used as an aid in troubleshooting. Shown in Figure 4-1 are the LANVIEW LEDs of the 9E423-24 module.

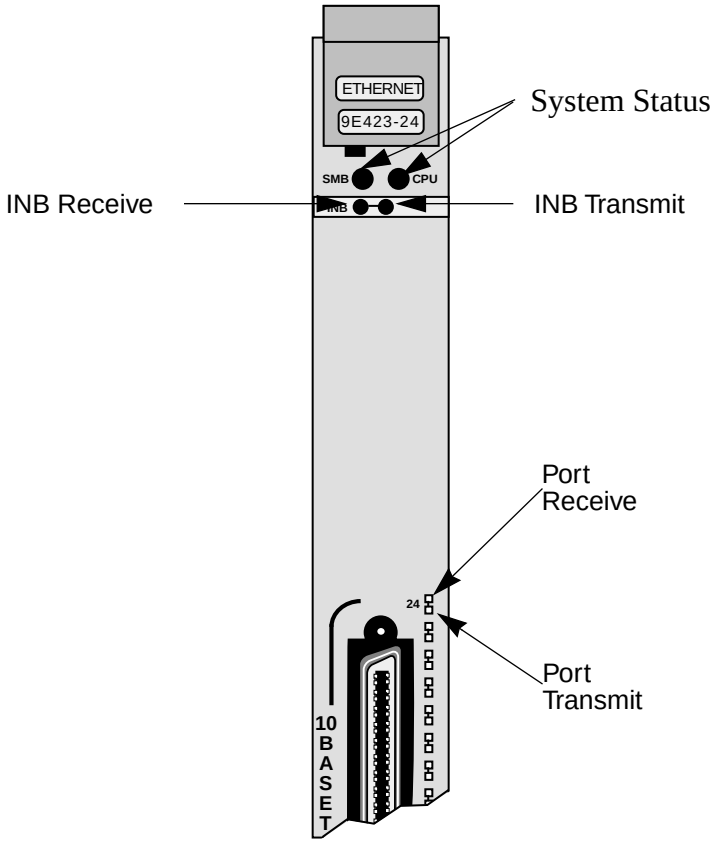


Figure 4-1. The LANVIEW LEDs

The function of the two System Status LEDs, System Management Bus (SMB) and CPU (Central Processing Unit), are listed in Table 4-1.

Table 4-1. System Status (SMB and CPU) LEDs

LED Color	State	Description
Green	Functional	Fully operational
Yellow	Testing	Power up testing
Yellow (Flashing)	Crippled	Not fully operational (i.e. one port may be bad)
Yellow/Green	Booting	Module is performing its boot process
Red	Reset	Module is resetting
Red (Flashing)	Failed	Fatal error
Off	Power off	Module powered off

The function of the INB Receive LEDs are listed in Table 4-2.

Table 4-2. INB Receive LEDs

LED Color	State
Green	Link, no activity, port enabled
Green (Flashing)	Link, port disabled
Yellow (Flashing)	Link, activity, port enabled (Flashing to steady on indicates rate.)
Red	INB fault, (not synchronized with the Monarch)
Off	No link, no activity (port enabled)

The function of the INB Transmit LEDs are listed in Table 4-3.

Table 4-3. INB Transmit LEDs

LED Color	State
Green (Flashing)	Activity, port enabled (Flashing to steady on indicates rate.)
Yellow (Flashing)	Port in standby state
Red	INB fault
Red (Flashing)	FAULT or Error (Flashing to steady on indicates rate.)
Off	No activity (port enabled)

The function of the Port Receive LEDs are listed in Table 4-4.

Table 4-4. Port Receive LEDs

LED Color	State
Green	Link, no activity port enabled
Green (Flashing)	Link, port disabled
Yellow (Flashing)	Link, activity, port enabled (flashing to steady on indicates rate)
Red	Fault
Off	No link, (port disabled)

The function of the Port Transmit LEDs are listed in Table 4-5.

Table 4-5. Port Transmit LEDs

LED Color	State
Green (Flashing)	Data activity (flashing to steady on indicates rate)
Yellow (Flashing)	Port in standby state
Red (Flashing)	Collision (with collision rate)
Red	Fault
Off	No activity, port can be disabled or enabled

Chapter 5

Specifications

Technical Specifications

CPU:

Intel i960 RISC based microprocessor

Memory:

4 Meg.	Local RAM (expandable to 12 Meg.)
4 Meg.	Flash Memory (expandable to 14 Meg.)
2 Meg.	Packet RAM
16 Meg.	DRAM (expandable to 16 Meg.)

Standards:

IEEE 802.1D

IEEE 802.3i 10BASE-T

Network Interfaces:

RJ-71 Connectors

Safety

It is the responsibility of the person who sells the system to which the module will be a part to ensure that the total system meets allowed limits of conducted and radiated emissions.

This equipment meets the safety requirements of:

UL 1950
CSA C22.2 No. 950
EN 60950
IEC 950

The EMI Requirements of:

- FCC Part 15 Class A
- EN 55022 Class A
- VCCI Class I

The EMC requirements of:

- EN 50082-1
- IEC 801-2 ESD
- IEC 801-3 Radiated susceptibility
- IEC 801-4 EFT

Service

MTBF (MHBK-217E)	>200,000 hrs.
MTTR	<0.5 hr.

Physical

Dimensions:

35.0 D x 44.0 H x 6.0 W centimeters
(13.8 D x 17.4 H x 1.2 W inches)

Weight:

Unit:	1.360.7 gr. (3 lbs.)
Shipping:	1.814.4 gr. (4 lbs.)

Environment:

Operating Temperature	5 to 40° C
Storage Temperature	-30 to 90° C
Relative Humidity	5% to 95% non-condensing